Rymer, Edwina

From: Dorsey, Nancy
Sent: Friday, October 16, 2015 12:33 PM
To: R6 6WQ-SG;Brown, Jamesr;Lawrence, Rob;Bates, William;Hildebrandt, Kurt
Subject: FW: USGS Oklahoma earthquake research to be released Tuesday (10/20/2015)

From: Matt Skinner [mailto:M.Skinner@occemail.com]
Sent: Friday, October 16, 2015 12:30 PM
To: Charles Lord; Tim Baker; Jim Marlatt; Bob Anthony; Dana Murphy; Jackie Hollinhead; Jordan Spencer; Joseph Briley; Joyce Boyd; Nicole King; Teryl Williams; Todd Hiett
Subject: FW: USGS Oklahoma earthquake research to be released Tuesday (10/20/2015)

From: Williams, Robert [mailto:rawilliams@usgs.gov]
Sent: Friday, October 16, 2015 11:09 AM
To: Boak, Jeremy M.; kyle.murray@ou.edu; Matt Skinner; Tim Baker; Craig.Sundstrom@ee.ok.gov; bakerjw@stanford.edu; cwills@consrv.ca.gov; H Kao; jack.hayes@nist.gov; kaberry@mines.edu; morgan@mines.edu; r.hoffman@kcc.ks.gov; randrews@ou.edu; reches@ou.edu; rick.simmers@dnr.state.oh.us; sbilek@nmt.edu; scott.tinker@beg.utexas.edu; Stuart Ellsworth - DNR; Anne Sheehan; Aryee, Prince; Azra Tutuncu; Bekki White; Bob Herrmann; Brian Blake; Brian Stump; Chris Cramer; Chuck Langston; David Mau; Frohlich, Clifford A; Gary Lee Patterson (glpttrsn); Halihan, Todd; Hayward, Chris; Heather Deshon; Jim Wilkinson; John Anderson; Katie Keranen; Mark D Zoback; Martin Chapman; Ralph Archuleta; Rex Buchanan; Robert Joseph; Scott Ausbrooks; Stephen Patrick Horton (shorton); Vaz, Rocky; William Andrews; Joe Gilman; craig.pearson@rrc.state.tx.us
Cc: William Leith; Michael Blanpied; Stephen Hickman; Mark Petersen; Morgan Moschetti; Susan Hough; Susan Hoover; Robert Graves; Paul Earle; Keith Knudsen; George Choy; Daniel E McNamara; Morgan Page; Austin Holland; Charles S Mueller; Elizabeth Cochran; David Wald; Oliver Boyd; Jill McCarthy; Harley Benz; Arthur McGarr; Justin Rubinstein; Suzanne Perry; David Applegate; Donyelle Davis; Heidi Koontz; Max Ethridge
Subject: USGS Oklahoma earthquake research to be released Tuesday (10/20/2015)

Hi All,

We wanted to give you advance notice about a new study by the U.S Geological Survey to be released online next Tuesday (10/20). The study presents evidence that, in addition to the recent earthquakes since 2009, most if not all of the earthquakes in Oklahoma in the past century were also induced by industrial activities.

This study by USGS scientists Susan Hough and Morgan Page, “A Century of Induced Earthquakes in Oklahoma?”, explores the especially high rates of activity in the state of Oklahoma, the background rate of natural (tectonic) earthquakes in the state, and how much the earthquake rate has varied through the 20th century. The study uses archival research at the Library of Congress and permit records from the Oklahoma Corporation Commission to track how waste water injection evolved over time, with an increase around 1950 due to an increase in secondary oil recovery and the increasing depletion of fields.

Here is the abstract from the paper:

A Century of Induced Earthquakes in Oklahoma?
by Susan E. Hough and Morgan Page

Bulletin of the Seismological Society of America, Vol. 105, No. 6, pp. –, December 2015, doi: 10.1785/0120150109
Abstract: *Seismicity rates have increased sharply since 2009 in the central and eastern United States, with especially high rates of activity in the state of Oklahoma. Growing evidence indicates that many of these events are induced, primarily by injection of wastewater in deep disposal wells. The upsurge in activity has raised two questions: What is the background rate of tectonic earthquakes in Oklahoma? How much has the rate varied throughout historical and early instrumental times? In this article, we show that (1) seismicity rates since 2009 surpass previously observed rates throughout the twentieth century; (2) several lines of evidence suggest that most of the significant earthquakes in Oklahoma during the twentieth century were likely induced by oil production activities, because (a) they exhibit statistically significant temporal and spatial correspondence with disposal wells and (b) intensity measurements for the 1952 El Reno earthquake and possibly the 1956 Tulsa County earthquake follow the pattern observed in other induced earthquakes; and (3) there is evidence for a low level of tectonic seismicity in southeastern Oklahoma associated with the Ouachita structural belt. The 22 October 1882 Choctaw Nation earthquake, for which we estimate Mw 4.8, occurred in this zone.*

Although I am not an author of this report, I may be able to answer some of your questions or route you to one of the authors who can provide additional detail.

Sincerely,
Rob

--
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